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ABSTRACT

This document presents three papers dealing with trade and industrial education research. "Educating the Vocational Teacher Educator" (Clyde Knight) reports a study to identify needs of vocational teacher educators to improve existing programs and make necessary changes in doctoral programs. "The Relationship between Perceived Learning Style and Teaching Style of Occupational Educators" (Ray Sanders, Michael Galbraith) presents findings of a study to examine the perceptual learning modalities of junior college occupational educators and how they thought they learned best and to compare this learning style preference to the teaching methodologies used in their instructional situations. "A Comparison of Beginning Drafting Achievement between Students Using Traditional Equipment and Students Using Computer Aided Design and Drafting Equipment" (Dennis Murphy) reports that no significant difference was found in the achievement of beginning drafting competencies between students using traditional drafting tools compared to students using computer-aided design and drafting tools. (YLB)

The Trade and Industrial Education Research Committee

A standing committee of the
Trade and Industrial Education Division of the
American Vocational Association

Proceedings of the Carrousel Session
American Vocational Conference
Las Vegas, Nevada
December 1987

Editors
Gene L. Roth
Richard Walter

Foreward

The Trade and Industrial Education Research Committee is a standing committee of the Trade and Industrial Education Division of the American Vocational Association. The mission of this committee is to promote systematic inquiry as a means of improving the quality of trade and industrial education programs and services. The committee accomplishes this mission through the organization of T&I research sessions at the annual American Vocational Association Conference and the development and dissemination of timely reports and monographs related to trade and industrial education.

This document contains three papers that were presented at the Trade and Industrial Education Research Committee's carrousel session at the 1987 American Vocational Association Convention, Las Vegas, Nevada. These papers were selected for inclusion in this document following a blind juried review by members of the T&I Research Committee. The T&I Research Committee would like to thank the respondents to our call for papers. These are the researchers who have made the annual T&I Research session a reality.

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Educating the Vocational Teacher Educator

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EDUCATING THE VOCATIONAL TEACHER-EDUCATOR

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Educating the Vocational Teacher-Educator

Introduction

With the increasing national interest in and criticism of teacher education programs the past few years, institutions responsible for training vocational teachers and developing their programs for teacher education need to be closely examined to determine if problems exist in the selection and education of the vocational teacher-educator. This study analyzes current developmental practices and ways to improve vocational educator education.

Problem

Though the Holmes and Carnegie Reports of 1986 addressed the problems of educating teachers, identifying teacher-education programs which succeed or fail, they have not addressed educating the teacher educator. Specifically, the problem is a lack of unity or coherence in requirements for the development of current vocational teacher-educators and suggestions to improve the development of successful vocational teachers for these technically-oriented, rapidly changing times.

Research Questions

This study answered the following:

1. What background experiences have teacher-educators in doctoral degree-granting universities had to prepare them to be vocational teacher-educators?

2. What specific educational experiences have they had to prepare them to be vocational teacher-educators?

3. What special work experiences did they have to prepare them to be vocational teacher-educators?

4. What university courses did they have to specifically prepare them to become vocational teacher-educators?

5. What curriculum changes (specific courses and other experiences) would they recommend for educating future vocational teacher-educators?

Population

The population for this study is the 36 major vocational teacher-educator education institutions with five or more vocational disciplines that grant a doctoral degree (identified in Adams and Biehms, 1984, Information Monograph No. 1, printed by the University Council for Vocational Education). Eighteen of the identified institutions were members of the University Council for Vocational Education (UCVE), and 18 were not, so group differences are also noted.

Purpose

This study identifies needs of present and future vocational teacher-educators in order to improve existing programs and to make any necessary changes in doctoral programs.

Findings

In the eight vocational certification disciplines (Agriculture, Business and Office, DE/Marketing, Health, Home Economics, Industrial Arts, Technical Education, and Trade and Industrial) of their 18 institutions, the UVCE institutions have 130 vocational-education certification specializations. The other 18 institutions have 117.

Head teacher-educators from UCVE institutions returned 78 (60%) of the surveys, and non-UCVEs returned 44 (37%) for a total of 122. Coordinators from the 18 UCVE institutions returned 16 (88%) of the surveys, and non-UCVE returned 11 (61%) for a total of 27.

The lengths of service as a teacher-educator ranged from zero to 30 years with 14 mean average years of experience. The years of experience as a teacher before becoming a teacher-educator ranged from zero to 21 with a seven year mean average.

Only 18% of the vocational teacher-educators had vocational education courses in secondary school; 70% have baccalaureate degrees, and 60% have master's in the specialization for which they are teacher-educators.

Nine of the 122 (7%) head teacher-educators held baccalaureate degrees, 40 (33%) held master's degrees, and 73 (60%) held doctorate degrees when they were hired as teacher-educators. Forty-one of the 122 identified their first choice reasons for pursuing a doctoral degree as "to be a vocational teacher-educator," and 38 specified "to be a college professor of their vocational discipline." For becoming a teacher-educator, 105 of the 122 teacher educators listed teaching experience as one of their most valuable work experiences; teacher educators in all eight disciplines believed the four higher education experiences most beneficial to them in rank order were: 1) research techniques, 2) curriculum development, 3) advanced methods of teaching, and 4) principles/foundations of vocational education. (See Table I for the top 14 of 43 items.)

The 27 coordinators identified 27 different courses that should be required for all teacher educators. In rank order the top five are: 1) History, Principles, and Philosophy of Vocational Education (19), 2)

Research (12), 3) Program Planning/Curriculum Development (11), 4) Evaluation of Vocational Education (10), and 5) Statistics (8). Table I shows some major disagreements as well as agreements as to the most valuable courses and experiences for developing career teacher-educators and what the university vocational coordinators report as presently required courses. The 122 teacher-educators recommended 39 kinds of lessons or specific experiences that should be included in a doctoral program of study for developing the vocational teacher-educators. (Items listed by more than one teacher educator are in Table II.)

Conclusions/Recommendations

Occupational experience in the vocational discipline is most important in the development of teacher educators. Teaching experience before becoming teacher educators is an important work experience. A master's degree in vocational teacher-education (in the specific discipline) is an important part of the educational background for teacher-educators. Therefore, specific core courses identified by all disciplines should be analyzed and updated to include these experiences needed by all teacher educators.

The 27 institutional coordinators listed courses and experiences now required which were different from those the 122 vocational teacher-educators believed should be course requirements and/or seminar experiences for preparing vocational teacher-educators.

The top ten most helpful college courses and experiences identified by the 122 teacher educators and the 27 vocational education coordinators as being currently required should be considered for all teacher-educator doctoral programs.

Institutions offering doctoral programs for developing teacher educators should study all items listed on Tables I and II to be sure their programs are not overlooking important teacher-educator competencies.

A specific foundations or "capstone" course should be established for the best possible professional preparation of teacher-educators.

National standards for educating vocational teacher-educators should be established.

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For the complete report--all research and findings--contact the author. Clyde B. Knight, 416 Classroom Building, Oklahoma State University, Stillwater, OK 74078-0406.

TABLE I

Courses and Higher Education Experiences Most Beneficial in Developing Teacher-Educator Abilities Reported by Teacher Educators and Required Doctoral Courses Reported by Coordinators

Rank Order by Teacher Educators	Courses or Experiences	Teacher Educator N-122	Voc Educator Coord N-27	Rank Order by Coord
1.	Research Techniques	44	12	2
2.	Curriculum Development/Program Planning	42	11	3
3.	Methods of Teaching (advanced)	30	0	0
4.	Principles/philosophy of Voc Ed	25	19	1
5.	Professional Vocational Teacher Education Courses	18	1	10
6.	Student/Teaching Supervisor	17	1	10
7.	Administrative Courses	14	1	10
8.	Graduate Assistantship (intern)	13	1	10
9.	Statistics	13	8	6
10.	Evaluation of Voc Ed	10	10	4
11.	Specialization Courses	10	2	9
12.	Supervision of Voc Ed	8	1	10
13.	Seminars with Graduate Students	5	9	5
14.	MS degree in Teacher Education	7	1	10
*	Educational Psychology	6	2	7
*	Ethics/Social Issues	0	3	8
*	Seminar in Teach(Education	0	3	8

*These items are not listed by teacher educators. (The teacher educators listed 43 items; the vocational coordinators 27).

TABLE II

Lessons and Experiences that Should be Included in Doctoral Programs of Study for Developing Vocational Teacher-Educators

Rank Order No.	Lesson or Experience	Agri.	Bus/Off	DE/Mktg	Health	Home Ec	IA/Tech	Tech Ed	T&I Ed	Total
1.	Curriculum/program development	2	3	4	1	3	6	-	5	24
2.	Graduate assistantship or internship	5	1	-	2	6	2	2	6	24
3.	Design/direct research project	4	4	-	3	2	2	1	3	19
4.	Supervise student teachers	2	3	2	-	5	5	-	2	19
5.	Intern with SDVTE	1	5	5	-	5	-	-	2	18
6.	Professional issues/university expectations	2	3	1	-	2	2	-	8	18
7.	Scholarly writing	2	3	1	1	4	6	-	-	17
8.	Supervise/evaluate programs	4	2	1	-	2	1	2	5	17
9.	Attend AVA (and other professional meetings)	1	-	2	-	3	2	1	1	10
10.	Teach and grade college courses	-	-	1	-	-	7	-	-	8
11.	Advanced teaching methods	3	3	-	-	-	-	-	1	7
12.	Conduct/plan in-service workshop	1	-	-	-	1	1	-	2	5
13.	Develop educational philosophy	-	-	3	1	1	-	-	-	5
14.	Seminars with Ed.D. candidates	4	-	1	-	-	-	-	-	5
15.	Teach undergraduate courses	2	-	-	1	1	-	-	-	4
16.	Develop a new course for teacher-education program	1	-	-	1	2	-	-	-	4
17.	Intern in research	2	-	-	-	-	-	-	2	4
18.	Processes for admission to teacher education	-	-	-	-	-	2	-	2	4
19.	Publish or perish	2	-	1	-	-	-	-	-	3
20.	Internship in AVTS	-	1	-	-	1	-	-	1	3
21.	Communication skills (written and oral)	-	-	-	-	-	2	-	1	3
22.	Public relations	2	-	-	-	-	-	-	1	3
23.	Require all teacher-education basic courses	-	1	1	-	1	-	-	-	3
24.	Student organizations	-	-	1	-	-	-	1	-	2
25.	Time/stress management	1	1	-	-	-	-	-	-	2
26.	Advisory committee development	-	-	1	-	-	1	-	-	2
27.	Administration experience/role	1	1	-	-	-	-	-	-	2
28.	Computer literacy	-	-	1	-	-	-	-	1	2
29.	Intern at national center	-	1	-	-	-	-	-	1	2
30.	Intern in business and industry	-	-	1	-	-	-	1	-	2
31.	Certification processes									
32.	Recruit students									
	Number of responses	43	33	27	10	41	41	9	46	250
	Total respondents	25	18	11	6	21	19	4	18	122

SECTION B

The Relationship Between Perceived Learning Style and Teaching Style of Occupational Educators

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THE RELATIONSHIP BETWEEN PERCEIVED LEARNING STYLE AND TEACHING STYLE OF OCCUPATIONAL EDUCATORS

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Relationship Between Perceived Learning Style
and Teaching Style of Occupational Educators

The analysis of teaching styles and learning styles is an important area of inquiry which has received a considerable degree of attention over the past two decades. While an awareness exists that educators communicate an identifiable set of classroom behaviors known as a teaching style, less emphasis is placed upon the teacher's own preferred learning style. As Cornett (1983) suggests, "whatever the teacher's learning style, it will have an effect on his or her teaching style" (p. 14). It was further argued that teachers tend to teach the way they learn. This relationship has not been examined in occupational education.

Learning style refers to the preferred way that individuals transform and assimilate information; its how the learner constructs meaning out of stimuli (Kolb, 1984). Every individual has a unique learning style, however, this style may be adjusted depending on the learning task confronting them and the teaching style being used. At best, styles are overall patterns that give general direction to learning behavior (Cornett, 1983).

Learning styles can be examined from three broad perspectives: oognitive, affective, and physiological. The cognitive aspects of learning style includes the way an individual processes, decodes, encodes, stores, and retrieves information (Kirby, 1979; Kolb, 1976, 1984). This cognitive aspect is characterized by the learners ability to focus or scan, randomly or sequentially, concretely or abstractly, the information. Each of these pairs of cognitive processes can be represented on a continuum, and given

times and the various instructional situation a switch in orientation can occur.

Another way of examining learning styles can be from an affective aspect. This aspect of learning style includes emotional and personality characteristics related to motivation, locus of control, interests, persistence, responsibility and sociability (Messick, 1976; McCarthy, 1981). Depending upon the learner, praise and external reinforcement may have a positive effect on the learning process while at other times the effect may be negative.

Finally, the physiological aspects of learning style which relate to sensory perception and environmental characteristics, can be examined (Dunn & Dunn, 1978; Barbe & Swassing, 1979). James and Galbraith (1985) refer to this aspect of extracting information from the environment by the senses as a perceptual learning style. Their learning style composition is comprised of seven elements: print, aural, interactive, visual, haptic, kinesthetic, and olfactory. Research of Galbraith and James (1984) has indicated that learners do have a dominant preferred learning modality but utilize other sensory modes to extract and process information as well.

The diagnosis of the cognitive, affective, and physiological aspects of learning style can be very complex or very simple, depending on the chosen instrument. Price (1983) and Cornett (1983) have provided excellent overviews of the various learning style instruments available that can assist educators and learners in their diagnosis and assessment.

As indicated, every individual has a preferred way of processing information. On the other hand, each individual involved in the process of instruction has a dominant and preferred teaching style. A teaching style

is an identifiable set of classroom behaviors associated with and carried out by the instructor. The chosen teaching style "is the operational behavior of the teacher's educational philosophy" (Conti & Welborn, 1986, p. 20).

However, this does not mean "they cannot add to or modify that style as circumstances warrant" (Cornett, 1983, p. 28). Modification of the teaching style may contribute to a more successful experience for the learner and the instructor. The more teachers learn about their dominant teaching and learning styles as well as the preferred learning styles of their learners, the more they can provide an explanation of what is happening in the learning situation and why.

The purpose of this study was to examine the perceptual learning modalities of junior college occupational educators and how they thought they learned best and to compare this learning style preference to the teaching methodologies that were utilized in their instructional situations. In this investigation of perceptual learning style and teaching style comparison, the following research questions were formulated:

1. Is there a significant relationship between perceptual modalities and teaching methods of junior college occupational educators?
2. Is there a significant relationship between perceptual modalities and teaching methods of junior college occupational educators by related major area of study, sex, years of teaching experience, and highest educational degree attained?

One hundred thirty-six educators (n=136) from ten junior colleges in three large southwestern states participated in the study. Respondents

comprised of 32 females and 106 males. Diversity of the subjects existed in terms of age, years of teaching, and the level of educational attainment.

Instrumentation

A survey questionnaire was utilized to gather the data from the subjects of the study. The questionnaire consisted of three components; information of personal data, perceptual learning style preference, and teaching methods/techniques used. The personal data section asked questions concerning the major area of teaching, sex, years of teaching experience, and the highest educational degree attained. The second section was a perceptual learning style inventory developed by James and Galbraith (1984). It asked the respondents to check the strategies/techniques through which they thought they learned best. Based on their responses, they were categorized into one of seven perceptual learning modalities: visual, aural, interactive, print, kinesthetic, haptic, and olfactory. The third part of the questionnaire asked the respondents to check the methods/techniques that they used the majority of the time in their own instructional situations. Their selected methods/techniques were then categorized into seven teaching styles: visual, aural, interactive, print, kinesthetic, haptic and olfactory. This part of the questionnaire was developed by the authors using the items from the James and Galbraith (1984) inventory which were modified and translated into a list of teaching methods/techniques.

Data Analysis

To answer the proposed research questions of the study, perceptual learning styles were determined and ranked from the most preferred to the

least preferred for the entire group of subjects and for each individual subgroup by major teaching area, sex, years of teaching experience, and highest educational degree attained. Next, the teaching styles of the entire group and each respective subgroup were determined and ranked from most used to least used. The Spearman's rho procedure was employed to determine if a correlation existed between the perceptual learning and teaching styles, ranks for the entire group and for each subgroup. This statistical technique examined the degree to which the rank scores on the two variables were linearly related. An alpha level of .05 was selected.

Findings

The findings in Table I indicate that the learning styles and teaching styles of the 138 junior college educators were almost identical in their rank order. Only the modalities of visual and interactive had different rankings for the overall group. The modality of visual had a ranking of two for the learning style and three for the teaching style. Interactive had a ranking of three for the learning style and a two for the teaching style. All other modalities were identically ranked for both the teaching style and learning style of the subjects surveyed. Utilizing the rank orders, Spearman's rho was calculated to determine the linear relationship of the two variables ($r_s=.964$, $df=6$, $p<.05$). According to the finding, a very high positive correlation existed between the junior college educators in the manner in which they preferred to learn and the methodologies which were utilized in their teaching. No significant difference existed between the two variables for the overall group of junior college educators.

Table 2 indicates the Spearman's rank order correlations of perceptual learning styles and teaching styles by major teaching area, sex, years of

teaching experience, and educational degree attained. According to teaching areas, the Spearman's rho was calculated for each of the five areas of study that the junior college educators taught in.

A very high positive correlation also existed between perceived learning style and teaching style for most of the areas studied. Exceptions included: the teaching area of agriculture, educators with 21 or more years of teaching experience, and educators with high school listed as the highest educational degree attained.

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Table 1

Rank Order of Perceptual Learning Styles

and Teaching Styles of Junior College Educators*

(n=138)

Modality	Learning Style	Teaching Style
Visual	2	3
Aural	4	4
Interactive	3	2
Print	1	1
Kinesthetic	6	6
Haptic	5	5
Olfactory	7	7

Table 2

Spearman's Rank Order Correlations of Perceptual Learning Styles and Teaching Styles by Major Teaching Area, Sex, Years of Teaching Experience, and Educational Degree Attained

Variable	# of Subjects	Correlation
Teaching Area		
Agriculture	9	.714
Business	36	1.000*
Engineering & industrial	54	.902*
Human service	4	.839*
Health	13	.893*
Other	22	.964*
Sex		
Female	32	.893*
Male	106	.964*
Years of Teaching Experience		
0-5	30	.964*
6-10	32	.929*
11-15	35	.964*
16-20	22	.929*
21 & over	19	.665
Educational Degree		
High school	9	.696
Associate	23	.839*
Bachelors	37	.964*
Master	66	1.000*
Doctorate	3	.938*

*p<.05

SECTION C

A Comparison of Beginning Drafting Achievement Between Students Using Traditional Equipment and Students Using Computer Aided Design and Drafting Equipment

Dennis Murphy

A COMPARISON OF BEGINNING DRAFTING ACHIEVEMENT BETWEEN STUDENTS USING TRADITIONAL EQUIPMENT AND STUDENTS USING COMPUTER AIDED DESIGN AND DRAFTING EQUIPMENT

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A Comparison of Beginning Drafting Achievement

Between Students Using Traditional Equipment

and Students Using Computer Aided Design and Drafting Equipment

Introduction

Drafting has been accomplished using very time consuming, almost artistic talents, in order to construct geometric shapes and lines that are universally understandable. Information contained in drawings has been transferred from engineer to drafter communicated to the tool maker and implemented into production. Changes or revisions to the drawings are time consuming and often require complete re-drawing of a "plate" in order to maintain clarity. Re-drawing is necessary to eliminate smudges, poor erasing and basic placement of features and dimensions.

There are certain objectives that students strive to maintain in a drafting environment. Giesecke (1984) suggests four such objectives that the student should preserve.

1. Accuracy. No drawing is of maximum usefulness if it is not accurate.

2. Speed. "Time is money" in industry and there is no demand for the slow drafter or engineer.

3. Legibility. The drafter or engineer should remember that the drawing is a means of communication to others and that it must be clear and legible in order to serve its purpose well.

4. Neatness. If a drawing is to be accurate and legible, it must also be clean; therefore, the student should develop a habit of neatness.

New computer technology has eliminated some of the problems associated with drafting. Smudging, line-density and most problems related to basic object placement are eliminated. The computer is consistent and inherently make no errors. Changes are easily accomplished using a computer drafting station. Drafting is a comprehensive, integrated decision-making process that requires many steps to completion of the final drawing. The drawing in both traditional and Computer Aided Design and Drafting are multi-step processes that are contingent upon dedication and expertise of the drafter. Then why not use only computer drafting stations?

First, computer drafting stations are expensive. They cost many times more than the equipment required to do manual drafting. Secondly, the computer drafting station requires skill and training in operation. Literacy with the CAD/D station requires the operator to learn about the hardware and software packages used in the drafting process. Thirdly, the computer drafter must still formulate many of the processes needed by the traditional drafter. Included in the process are, sketching, layout, perspective, dimension and size. A fourth element is a lack of complete Computer Aided Drafting acceptance. The questions are then asked, "Is there a significant difference achieved in drafting competencies, knowledge and skill between students using traditional drafting tools and students using Computer Aided Design and Drafting (CAD/D) tools?" Secondly, "Is there a need for CAD/D?" "CAD is revolutionizing the drafting-design field. CAD is rapidly finding its way into industry, changing the methods used to produce drawings. The basic tools are being replaced by the computer..." (Bertoline, 1985). Consequently, this study was designed to

investigate whether computer drafting tools could be as effective in teaching drafting as the manual process.

Null Hypothesis

There is no significant difference in the achievement of beginning drafting competencies between students using traditional drafting tools compared to students using CAD/D tools.

Methods and Procedures

This study compared the effectiveness of two methods of drawing in a beginning drafting class. The instructional modes consisted of a traditional drafting control group and a CAD/D experimental group. Scores on a pre-test, given during the first lab period for both groups and a post-test were given to show any losses or gains in knowledge achievement. The experiment was conducted during fall quarter, 1986, at Utah State University. The students in both the control and experimental groups were advised as to the nature of the experiment. An identical test was administered as a pre-test and post-test. A "hands-on" final practical exam, given during the final week of class evaluated skill acquired during the final week of class evaluated skill acquired during the quarter.

Data Analysis and Findings

A pre-test given during the first lab period for the control group (traditional) and the experimental group (CAD/D) netted these results using a standard t-test.

Pre-test (figure 1)

Number of observations in group one?	16
Number of observations in group two?	16
Mean of group one?	48.69

Mean of group two? 50.13
Population Variance (s^2) group one? 51.96
Population Variance (s^2) group two? 98.12
Degrees of Freedom = 30
T-test (T) is = -.4701775
Critical T = 2.042
Lower Confidence Interval = -7.693992
Upper Confidence Interval = 4.813988
******
RETAIN
******

A performance final "hands-on" examination given during the final testing period yielded these results:

Performance Final Scores (figure 2)

Number of observations in group one? 16
Number of observations in group two? 16
Mean of group one? 65.81
Mean of group two? 73.31
Population Variance (s^2) group one? 215.10
Population Variance (s^2) group two? 220.10
Degrees of Freedom = 30
T-test (T) is = -1.438059
Critical T = 2.042
Lower Confidence Interval = -18.14977
Upper Confidence Interval = 3.14977
******
RETAIN
******

A post-test, identical to the pre-test was administered during the last week of class, was given to the students to measure any drafting achievement gained during the course of the quarter. The test was also measured using a standard t-test at a .05 level of confidence.

Post-test (figure 3)

Number of observations in group one? 14
Number of observations in group two? 16
Mean of group one? 78.43
Mean of group two? 74.56
Population Variance (s^2) group one? 89.19
Population Variance (s^2) group two? 176.26

Degrees of Freedom = 28
T-test (T) is = .9073386
Critical T = 2.048
Lower Confidence Interval = -4.865177
Upper Confidence Interval = 12.60518
******
RETAIN
******

Conclusions and Findings

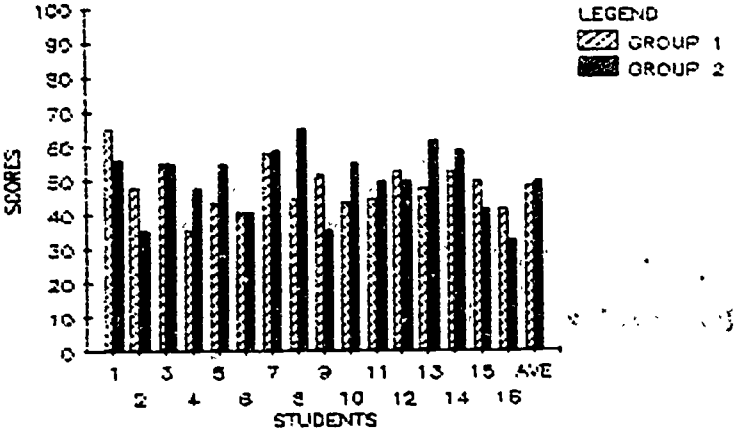
The results of the pre-test, performance final and post-tests indicate that there is no significant difference in the drafting competencies between students using traditional drafting tools and those students using CAD/D tools. All of the t-tests retained the null hypothesis and therefore we accept the findings. One interesting observation was that the students using CAD/D tools were required to learn both drafting techniques and the computer operation during the course of their study. While accomplishing this task, the experimental group maintained the same degree of proficiency as the control group. We would recommend that this study be repeated to further validate its results.

References

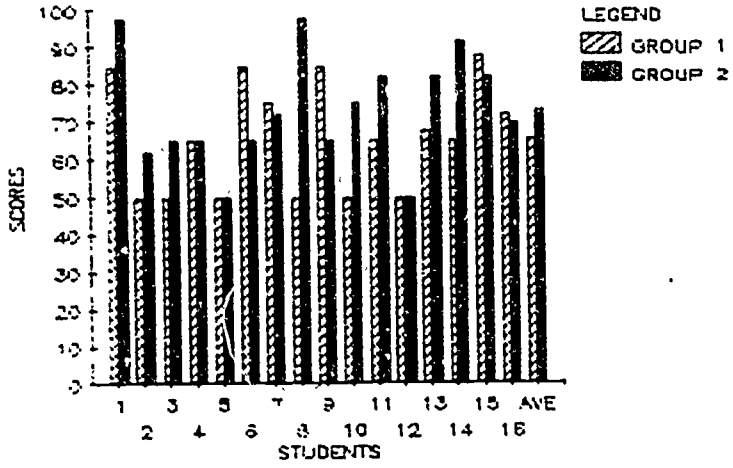
Bertoline, G. R. (1985) Fundamentals of CAD. First Edition. Albany, NY: Delmar Publishers, Inc.

Giesecke, F. E. (1984) Engineering graphics. Third Edition. New York, NY: Macmillan Publishing Co.

PRETEST
GROUPS 1 AND 2
PLUS AVERAGES
(FIGURE 1)



PERFORMANCE FINAL
GROUPS 1 AND 2
(FIGURE 2)



POSTTEST
GROUPS 1 AND 2
(FIGURE 3)